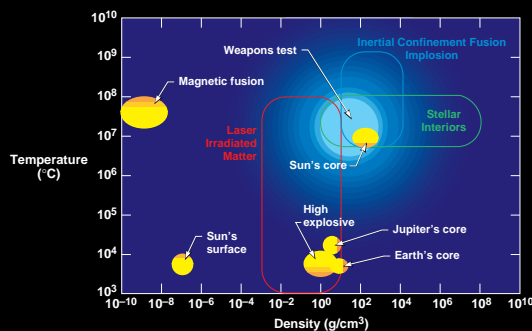
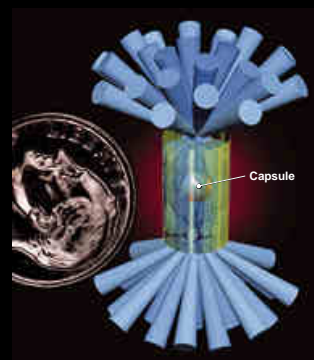


Plasmas for National Security

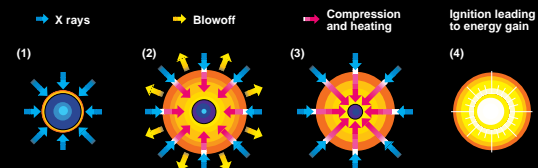
Plasma Conditions



Plasmas for national security span an enormous range in temperature and density. For example, nuclear weapons conditions overlap with stellar interior and ICF plasmas.

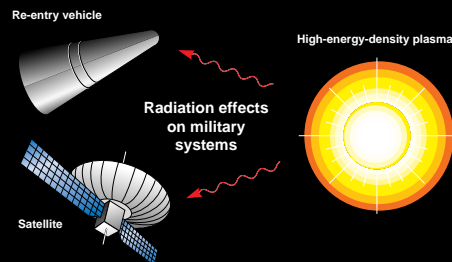


In Inertial Confinement Fusion, laser beams or ion beams energize the inside of a hohlraum target. X rays then rapidly heat the capsule (1), causing its surface to blow off (2). The resulting force compresses the plasma fuel (hydrogen isotopes), raising temperatures to 100,000,000°C and densities to 20 times greater than lead. This ignites the plasma fuel (3) and produces a fusion energy output (4) many times the laser energy input (energy gain).



High-energy-density plasmas created from Inertial Confinement Fusion (ICF) experiments have strong governmental support because of their utility for weapons research. The plasmas within an ICF target are similar to those in a nuclear weapons test.

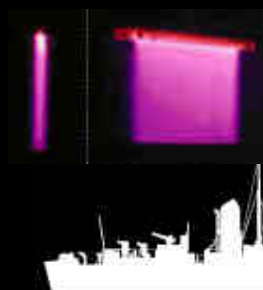
Plasma Energy Densities



High-energy-density plasmas created within the laboratory can also be used for nuclear weapons effects studies.

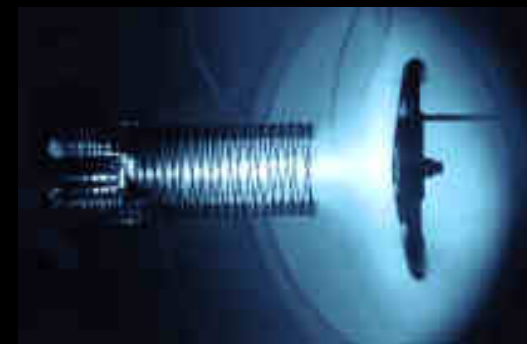
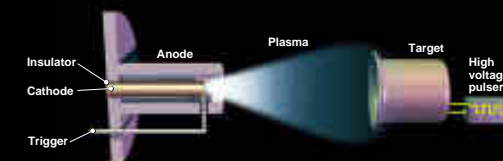


Such high-energy-density plasmas are often produced using pulsed-power hardware.

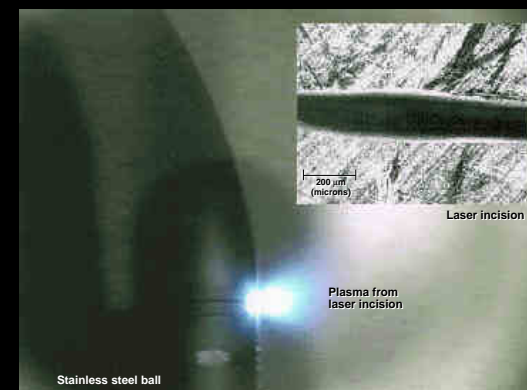


Mirrors using low-density plasmas are attractive candidates for electronic steering of shipboard radar for the 21st century.

Plasma Technologies



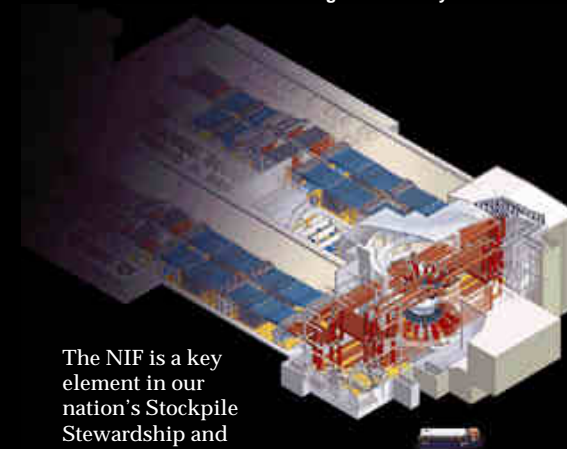
Plasma ion implantation can produce highly adherent ceramic coatings for nuclear weapons applications.



Plasmas produced from ultra-short laser pulses can improve efficiency and reduce collateral damage in metal cutting in areas of interest within national security.

Plasma Ignition

National Ignition Facility



The NIF is a key element in our nation's Stockpile Stewardship and Management Program, which aims to maintain confidence in the safety and reliability of the U.S. nuclear weapons stockpile under a Comprehensive Test Ban Treaty. ICF target data from NIF will be used to verify complex computer simulations of nuclear weapons physics.

IFE power plant concept



The NIF will also be used for research in inertial fusion energy (IFE). ICF plasmas and supporting advances, such as direct-drive target illumination and ion-accelerator driver development, will provide the basis for realistic development of IFE.